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Urol Clin N Am 35 (2008) 59–68

UROLOGIC
CLINICS
of North America

HIV-AIDS – Urologic Considerations

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Since the early 1980s and the identification of HIV and AIDS, doctors and health care workers have struggled to treat this disease and its comorbidities. The virus has infected an estimated 39.5 million individuals worldwide, with an estimated 1.2 million people in the United States [1]. Since 1996 and the advent of combination therapy of antiretroviral medications, known as highly active antiretroviral therapy (HAART), patients who would have at one time died of renal failure caused by HIV nephropathy or opportunistic infections with atypical organisms are currently actively treated for quality-of-life conditions, such as voiding dysfunction, fertility, and erectile dysfunction (ED). The patient population living with HIV survives longer and experiences and needs treatment for expected age-related conditions. They have complications of the disease and the therapies they receive. Nephrolithiasis, a known complication of the protease inhibitors, has increased urologists involvement in caring for patients who have ureteral obstruction. Common age-related malignancies affect patients who have HIV, and as the population of HIV-positive patients lives longer, urologists may be asked about other malignancies, such as HIV-related lymphomas, which can cause ureteral obstruction, and Kaposi's sarcoma (KS), which involves the genitalia. This article reviews the urologist's involvement in the medical complications that have arisen from HIV or its treatment.

Urinary tract infections

Patients who have HIV experience a greater risk of urinary tract infections (UTIs) when their CD4 counts fall below 500/mm^3 [2,3]. Voiding dysfunction with urinary stasis is also implicated as a factor in the increased incidence of UTIs in HIV-positive patients [4]. A 17% incidence rate of UTI is seen in HIV-positive patients [4,5]. Patients may have bacteruria and be asymptomatic; however, common symptoms include dysuria, frequency, fever, and hematuria [3–6]. Patients with asymptomatic bacteria may not require treatment [6,7]. Common bacterial pathogens in HIV-infected patients are *Escherichia coli*, *Enterobacter* (Enterococci), *Pseudomonas aeruginosa*, *Proteus* spp, *Klebsiella*, *Acinetobacter*, *Staphylococcus aureus*, group D *Streptococcus, Serratia,* and *Salmonella* spp [3–7].

Disseminated infections may affect potentially any portion of the urinary tract. They are usually caused by atypical organisms and frequently associated with a depressed immune system. Atypical pathogens may include fungi (*Candida albicans*, *Aspergillus, Blastomyces*, *Cryptococcus neoformans*, *Cryptosporidia*, *Histoplasma capsulatum*), parasites (*Toxoplasma gondii*, *Pneumocystis carinii*), mycobacteria (*Mycobacterium tuberculosis*, *Mycobacterium avium* complex), and viruses (cytomegalovirus and adenovirus) [6–10]. Patients with urinary symptoms and negative urine culture results should be evaluated further with atypical culture and stain analysis. Treatment with culture-sensitive antibiotics is recommended when available.

Epididymitis, orchitis, and necrotizing fasciitis

Many HIV-positive patients present with inquiries about urethral infections related to sexually transmitted diseases, such as *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. These infections can propagate and spread to cause epididymitis-orchitis. Other opportunistic and systemic

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doi:10.1016/j.ucl.2007.09.001

infections lead to abscess formation in the penoscrotal region. Organisms associated with suppurative and antibiotic resistant infections in this population include cytomegalovirus, *Candida*, mycobacterium, *Toxoplasmosis*, and *Salmonella*. These infections, especially *Salmonella*, may be difficult to eradicate and require lifelong suppressive therapy. Initial treatment recommendations include a 2- to 4-week regimen of doxycycline, 100 mg, twice daily and ciprofloxacin, 500 mg, twice daily [3].

Depending on the severity of the infection and how immunocompromised an individual is, necrotizing fasciitis of the genitalia or Fournier's gangrene may develop [11]. This aggressive infection may be the initial presentation of a patient who has HIV. Immediate diagnosis with wide surgical débridement to healthy and viable tissue is necessary. Broad-coverage antibiotics are used until the organism and its sensitivities are obtained. Patients may require aggressive hemodynamic support, and multiple surgical débridements may be necessary. A diverting colostomy and eventual skin grafts may be necessary for appropriate healing to take place.

Prostatitis

The algorithms used to treat basic urologic conditions, such as prostatitis and chronic pelvic pain syndrome, in HIV-positive patients are similar to those used to treat non–HIV-positive patients. In treating HIV-positive patients, however, evaluation and treatment of atypical organisms frequently are warranted. The incidence of acute bacterial prostatitis is 1% to 2% in the general population, whereas it is 3% in asymptomatic, HIV-infected patients and 14% in patients who have AIDS [4,12]. These data predate treatment with HAART and likely are currently lower in incidence. Patients who have acute prostatitis may experience fevers, dysuria, frequency, malaise, urinary retention, and perineal pain [3,4,12]. Digital rectal examination may indicate an enlarged, tender, and potentially fluctuant prostate [3,4,6,12]. In patients who have HIV, the risk of developing a prostatic abscess or urosepsis is greater than in the general population because of the atypical pathogens previously mentioned. They require increased monitoring and evaluation and likely an extended duration of culture-specific antimicrobial and antifungal therapy [4,12]. If surgical intervention to drain a prostatic abscess is necessary, it can be accomplished by either transrectal or perineal aspiration or transurethral resection. Symptomatic and disseminated fungal infections may require long-term antifungal-directed therapy and prostatectomy [13]. As with all infections in immunocompromised patients, atypical pathogens always should be considered.

Urolithiasis

Patients on HAART therapy are managed with protease inhibitors, which act by preventing terminal maturation in the formation of new viral particles and are implicated as a cause of urolithiasis [14]. Indinavir, a protease inhibitor that has been well investigated, is known to cause urolithiasis in 5% to 25% of HIV-positive patients [14,15]. Metabolized mainly by the liver, 20% of indinavir is not metabolized and is excreted in the urine within 24 hours [4,16–19]. Indinavir crystallizes when the pH of urine is more than 5 and the concentration is sufficient. Indinavir, as a stone component, is seen only in 29% of calculi. The remaining stone components are calcium oxalate, ammonium acid urate, and uric acid [20]. Although uncommon, pure indinavir calculi are radiolucent on radiographic studies and there may be minimal findings on noncontrast CT studies [21].

Patients who have HIV also have metabolic imbalances that may result in calculi formation. Disturbances from malnutrition and diarrhea play a role in dehydration, increase in urinary concentration, acidification, and hypocitraturia [20]. In this metabolic state, stone formation is promoted. Patients may present with flank pain and microscopic hematuria, which requires intravenous urogram, renal ultrasonography, or a noncontrast spiral CT scan. Renal collecting system dilation may be the only radiologic finding in patients with indinavir calculi, whereas other components are seen as calcifications [4,6]. Conservative measures with hydration and analgesia may be effective in up to 80% of patients [19].

Once diagnosed with calculi, patients should undergo a complete metabolic evaluation. Recommendations include not only stone analysis but also two 24-hour urine collections for volume, calcium, oxalate, uric acid, magnesium, phosphorous, and sodium. Serum studies should be examined for blood urea nitrogen, creatinine, calcium, and serum electrolytes [20]. Recently, investigators looked at the early plasma trough levels of indinavir in patients receiving 800 mg of indinavir three

times daily as a first-line protease inhibitor. Higher trough levels were associated with a higher rate of severe nephrolithiasis and a higher rate of all serious adverse reactions. Recommendations based on these conclusions included early indinavir trough determination and dose adjustment [22]. Stopping indinavir did not result in complete resolution of calculi formation or complications associated with them; therefore, patients rarely need treatment with an alternative drug [23].

When conservative management does not lead to resolution of symptoms or if a patient becomes acutely ill because of intractable pain, UTI, or high-grade obstruction, temporary stenting or nephrostomy tube placement is necessary. Manipulation with endoscopic stent placement may be enough to allow passage of these soft and gelatinous matrix stones, as in the case of pure indinavir stones [4]. Occasional ureteroscopic or percutaneous nephrolithotomy may be necessary for stone extraction.

Sexual dysfunction

ED and hypogonadism are recognized conditions in men who have HIV. Testicular atrophy is common and leads to infertility, ED, and decreased libido [6]. In one study that examined serum testosterone and ED in 300 such patients, 17% of men were hypogonadal. Increasing age and body mass index were positively associated with hypogonadism. The authors found no association between ED or hypogonadism and HIV therapy [24].

Testosterone supplementation has been used in testicular and hypothalamopituitary diseases for several decades. There has been growing interest in the use of testosterone in male contraception, aging, muscle-wasting conditions such as HIV, and ED [25]. The new transdermal patches, gels, and sustained-release buccal tablets are designed to provide testosterone levels that are close to normal physiologic levels [25]. These treatments, in addition to phosphodiesterase type-5 (PDE-5) inhibitors, can effectively treat men who have HIV and suffer from low libido caused by low levels of testosterone and ED.

Effective treatment of ED actually can be a factor in spreading the HIV virus. In one study by Karlovsky and colleagues [26], data obtained from the Centers for Disease Control and Prevention (CDC) in Atlanta demonstrated an increased incidence of gonorrhea among elderly men living in south Florida. Gonorrhea is a vehicle of transmission for HIV. Although there was not a direct correlation between the use of PDE-5 inhibitors and the increasing incidence of HIV among elderly men in south Florida, the association was suggested. Possible reasons may be that these elderly men grew up in the age before universal precautions and currently engage in risky behavior. Another example, in a study by Benotsch and colleagues [27], which discussed 304 homosexual men who engaged in sexual activity while on vacation or business trips, concluded that men who were taking PDE-5 medications reported higher rates of sexually risky behaviors.

HAART also plays a role in sexual dysfunction. Lamba and colleagues [28] found the incidence of ED and decreased libido in HIV-positive homosexual men to be 26%. In that study, in patients who were taking HAART, the incidence of reduced libido was 48% (caused by raised estradiol levels) and the rate of ED was 25%. Studies support and oppose the occurrence of sexual dysfunction in HIV-positive men taking HAART [29–31]. PDE-5 inhibitors also may have an interaction with indinavir and other protease inhibitors. In a report by Murray and colleagues [32], indinavir was a potent inhibitor of the hepatic mechanism of sildenafil. They suggested that starting sildenafil at a lower dose would be more appropriate in patients taking indinavir.

Men who are HIV positive are more likely to experience depression [33,34]. Depression is associated with low libido and ED, and common antidepressant medications, such as selective serotonin reuptake inhibitors, also decrease libido and sexual performance [35,36]. Knowing the effects on libido and sexual dysfunction, a PDE-5 inhibitor may be necessary to alleviate the sexual symptoms without interfering with depression therapy. The prescribing of PDE-5 inhibitors may allow patients to regain sexual activity and confidence, which can improve depressive symptoms. Subsequently, treatment with a lower dose of selective serotonin reuptake inhibitors may be possible [37,38].

Another aspect in treating patients who are HIV positive is the cost of the PDE-5 inhibitors. Because some insurance companies may not cover the cost of these pharmacotherapies, the financial burden of antiretroviral medications and PDE-5 inhibitors may fall primarily on the patient. Patients may opt for surgery, because they know a penile prosthesis is paid for by insurance, whereas the medication may not be [39]. There also may be somewhat of an ethical dilemma in treating HIV-positive patients for ED with either

pharmacotherapy or surgery if a male patient does not have a steady committed partner and engages in risky behavior with multiple partners. By treating the ED condition, the physician may feel that he or she is essentially giving the patient a ''loaded gun.'' A confidential, supportive doctor-patient relationship helps to improve patients' quality of life while trying to help stop the spread of the virus [40].

Urologists and other health care professionals who treat ED in HIV-positive patients face a significant challenge in trying to restore normal sexual function. It requires knowledge of the HIV disease and potential drug interactions and learning strategies aimed at reducing the infection rate. This interaction sometimes goes beyond the doctor-patient relationship to include careful consideration of the rights of the partner and society as a whole [39].

Fertility

With improving life expectancy on HAART, patients present with questions pertaining to fertility and disease transmission. Some patients have abnormal semen parameters associated with atrophy of the testes. Atrophy may be related to hypothalamopituitary axis dysfunction, inflammation, infection, chronicity of the disease, or malnutrition [4,41–43]. HIV has its own cytotoxic affect on germinal tissue and Sertoli cells, which leads to testicular atrophy.

Attention and counseling must be given to patients who have HIV and are interested in becoming parents. Transmission rates for unprotected heterosexual intercourse range from 1:1000 per contact (male/female) to less than 1:1000 (female/male) [44]. Options to minimize risk for horizontal and vertical transmission to offspring should be explained. For men infected with the virus, a method described by Semprini and colleagues in 1992, which involves sperm washing followed by assisted reproductive techniques, has proved to be the safest method to date [45,46]. Tested sperm carry a 10% risk of harboring the virus, which implies that patients are still at risk; in Europe, however, more than 500 children have been born after sperm washing, with zero seroconversions [44]. Mother-to-child transmission—or vertical transmission—can be minimized to less than 2% if cesarean section is performed along with intrapartum infusion of antiviral medications [6].

Voiding dysfunction

Early data on voiding dysfunction in HIV-positive patients indicated that few patients experienced disturbances in voiding; cases that involved dysfunction were usually associated with UTIs [47]. Patients do present to the primary physician or urologist complaining of lower urinary symptoms, such as dysuria, hesitancy, and decreased stream. Some patients at time of seroconversion experience various neurologic findings, including acute urinary retention. With disease progression patients may experience worsening micturition impairments. Disturbances may be related to recurrent or chronic UTI, central nervous system disturbances (eg, HIV encephalitis, cerebral toxoplasmosis, and HIV-related dementia), or peripheral neurologic deficits [4,6,47–49]. Central and peripheral neurologic causes account for approximately 61% of voiding dysfunction seen in affected patients [49]. AIDS-related malignancies or infectious processes, such as herpes and cytomegalovirus, are a few causes of common lower motor deficits usually seen [4].

Urodynamics may be useful in identifying underlying dysfunction. Common urodynamic findings identified by Hermieu and colleagues [49] included hypo- and hyperreflexia, acontractile hypoactive bladder, and detrusor-sphincter dyssynergia. Bladder hypocontractility was seen in 35% to 45% of patients at time of urinary retention. Outlet obstruction caused by prostatic enlargement only accounted for 18% of cases in patients with urinary retention. Treatment options for patients with outflow obstruction or hypo- and hyperreflexia can include intermittent catheterization until a patient's neurologic deficits prevent this task, at which time a chronic catheter or suprapubic cystotomy should be used. Outlet obstruction also can be treated with endoscopic methods when clinically indicated. Bladder hyperreflexia may be treated with anticholinergic agents as first-line therapy. Early reports indicated that patients who experience these abnormalities had a poor prognosis, with mortality usually within a mean of 8 years [3,49].

HIV-associated nephropathy

Despite HAART, kidney disease and renal failure are the fourth leading causes of death in HIV-positive patients [50]. Renal failure may be caused by metabolic dysfunction and volume depletion from chronic diarrhea, nephrotoxic

medications, infections, ureteral obstruction from malignancies, and intrinsic diseases such as HIV-associated nephropathy. HIV-associated nephropathy occurs more frequently in HIV-positive black patients, with a black-to-white ratio of 12:1. HIV-associated nephropathy has become the third leading cause of end-stage renal disease among black patients aged 20 to 64, after diabetes and hypertension [51]. Characteristics include nephrotic disease with proteinuria more than 3.5 g/d and edema and hypertension. Renal ultrasound evaluation occasionally indicates kidney enlargement, but usually they are within normal size and have increased echogenicity. Diagnosis is confirmed with biopsy. Histologic findings may include a collapsing variant of focal segmental glomerulosclerosis, proliferation of renal tubular and visceral epithelial cells (podocytes), tubular microcystic formation, edema, interstitial fibrosis, and infiltration of the interstitium with leukocytes [52]. Patients progress rapidly, with end-stage renal disease with dialysis requirement occurring within 10 months of diagnosis. Despite hemodialysis, the 1-year-mortality rate is 50%; on antiretroviral therapy it still reaches approximately 30% [50]. Treatment includes HAART therapy for persons not on HIV medications and angiotensin-converting enzyme inhibitors. Medications that depend on renal breakdown and excretion should be adjusted with worsening renal insufficiency and failure.

Malignancies

The cancer rates in patients who have HIV have declined in the HAART era, but despite treatment, patients are still at higher risk for malignancies. Many mechanisms proposed that support malignancy formation include decreased immune surveillance, a direct effect of viral proteins, cytokine dysregulation, or other immunologic or viral cofactors [53,54] Patients are living into their sixth and seventh decades of life and are at a greater risk of malignancies than noninfected patients. Renal cell carcinoma, for example, carries an 8.5-fold greater risk for infected patients compared with noninfected patients [4,6,55].

A study by Engels and colleagues [56] assessed the relationship between HIV serostatus and the likelihood of developing KS, non-Hodgkin's lymphoma (NHL), or cervical cancer over time. Using registry data from the AIDS Cancer Match Registry Study and other cancer registries, comparisons were made between three different periods. Years 1980 to 1989, 1990 to 1995, and 1996 to 2002 were compared. The results of this study clearly showed that the risk of developing KS and NHL declined substantially over time; however, individuals who have HIV still maintained a higher risk of developing KS and NHL compared with persons in the general population. A second study followed a total of 59,101 individuals from 1992 to 2002 using data from various surveillance groups, such HIV Outpatient Study, a prospective observational study in HIV-positive patients, and the Surveillance and End Results project, which was composed of the general population. The results were compared to assess the relative risk of developing malignancies in the HIV-positive population. Risk was greatest in malignancies such as KS, lymphomas (Hodgkin's and non-Hodgkin's), cervical, liver, and testicular cancer, and melanoma. Of note, the researchers noted a decreased risk in patients who had HIV in relation to prostate and breast cancer [57].

Kaposi's sarcoma

KS is the most common HIV-related malignancy. Originally, in its classic form the disease was found in elderly men of Mediterranean or African background. Later it was seen in patients who were immunocompromised, such as transplant patients and persons who had with HIV/AIDS. Up to 20% of patients infected with HIV not being treated with HAART are affected by KS. This number is down approximately 90% from the pre-HAART era [58]. The human herpesvirus type 8, also known as KS-associated herpesvirus, is responsible for the development of KS. KS is rarely fatal. It arises from lymphatic endothelial cells that form vascular channels and give rise to the characteristic bruise-like appearing lesions [59]. KS, which more commonly occurs in men, can present as an indolent process, with minimal physical findingss or as a disseminated aggressive disease. Lesions usually present as red, black, purple, or brown nodules, macules, or patches that are typically painless but also can be ulcerating and painful. KS can present as a systemic disease that affects internal organs, including the kidneys [60] and testes [61].

Genital lesions appear in approximately 20% of patients who have KS [62]. Painful lesions can present on the penoscrotal region and cause edema and pain. Urethral meatal lesions may cause outlet obstruction and urinary retention.

Temporizing these patients with suprapubic cystotomy may be necessary until definitive treatment takes place [63]. Rare presentations of penile necrosis and gangrene have been reported as a result of vasculitis or vascular obstruction seen with progression of KS [64].

KS is not curable and treatment is either local or systemic. Primary treatment for KS involves initiation of HAART if patients have not started such treatment. Local treatment for cosmetically disturbing or painful lesions includes cryosurgery, vinca alkaloids, intralesional bleomycin or intralesional interferons, soft x-ray radiation, electron beam therapy, cobalt radiation (fractionated), retinoids, 9-cis-retinoic acid, and alitretinoin [58]. Systemic treatment for disseminated or visceral disease uses chemotherapeutic agents. The gold standard combination therapy of adriamycin, bleomycin, and vincristine has been replaced in recent years with liposomal anthracyclines, such as daunorubicin and doxorubicin [58]. In a recent study, the response rate of pegylated liposomal doxorubicin with HAART was 76% versus 20% in the HAART-only treatment group of patients who had advanced KS [65]. Paclitaxel is also effective in treating advanced KS and has a partial remission rate of 60% [66].

Immunotherapy is used for systemic treatment of KS with interferons. The efficacy of interferon treatment depends on the cellular immune status of a patient. Remission rates of 45% to 70% are seen. Studies indicate that to achieve remission rates of more than 45%, at least 400 CD4+ T cells/μL are needed [58]. Systemic therapies carry a greater risk for worsening of immunosuppression and opportunistic infections.

Lymphoma

Like KS, NHL is an AIDS-defining malignancy. Ninety percent of HIV-associated NHLs are of B-cell origin [67]. They are usually aggressive and when treated they are prone to recur. The incidence has decreased in patients taking HAART [57]. Patients may have lymphadenopathy, fevers, night sweats, and weight loss. NHL of the testes may present bilaterally and is usually disseminated at the time of diagnosis. Orchiectomy and radiation in combination with systemic chemotherapeutic agents are treatment options. The incidence of relapse and rapid progression is high in immunocompromised men. Renal involvement of NHL in patients who have AIDS is 6% to 12%, and presentation may be bilateral [4,6]. Ureteral obstruction from retroperitoneal lymphadenopathy is often diagnosed while evaluating renal failure and may require ureteral stenting or percutaneous nephrostomy drainage [4]. Complete remission is seen in 50% to 75% of patients with systemic treatment [67]. With relapse, progression can be rapid.

Testicular tumors

The prevalence of testicular tumors in immunocompromised patients ranges from 20 to 57 times that of the general population [4,6,68]. Germ cell testicular tumors are the third most common AIDS-related malignancy. A study that compared HIV-positive patients with a control population suggested that the incidence of seminoma is increased in men who have HIV [69]. In this population, testicular tumors may present bilaterally, as in NHL, and be disseminated at presentation. The difficulties experienced by practitioners pertain to the treatment of these malignancies and potential worsening of immunosuppression. HIV-positive patients, initially considered to be poor candidates for radiation and chemotherapy, are currently believed to have equal morbidity and response as patients who do not have HIV [4,68]. Patients should undergo treatment based on tumor histology and stage. With this in mind, patients may experience early mortality from disease recurrence or progression secondary to their underlying disease.

Dermatologic malignancies of the genitalia

HIV and human papillomavirus are sexually transmitted diseases with similar risk factors for transmission. Human papillomavirus types 16 and 18 are considered high risk in anogenital malignancy formation of carcinoma in situ and squamous cell carcinoma [70]. Carcinoma in situ of the penis, also known as Bowen's disease and considered a premalignant lesion, appears as a bright red or pink scaly patch on the glans or shaft. It should be treated with cryotherapy, topical 5-fluorouracil, laser therapy, or surgical excision. Squamous cell carcinoma is usually more aggressive in HIV-positive patients and should be excised and staged. Regional lymphadenectomy, radiation, or systemic chemotherapies should be used in a manner similar to treatment used for individuals not infected with HIV [71].

Prostate cancer

With increasing life expectancy, prostate cancer is expected to become an increasingly important health problem for men infected with HIV. Few cases are reported in the literature [72,73], so a definitive link between HIV and prostate cancer is uncertain. Early published data predated HAART therapy and indicated an increased risk for prostate cancer in the HIV-positive male population [7]. HIV with prostate cancer carried a poor prognosis, which was believed to be secondary to a patient's severely depressed immune system and hypogonadal state, which made androgen deprivation an ineffective therapy option. Some clinicians advocate screening patients in their early forties because of the potential for prostate cancer presenting in a disseminated manner with nonspecific features [73,74]. Patients can present with impaired constitutional symptoms, fever, weight loss, fatigue, and exertional dyspnea, despite having a sustained CD4+ count, having a contained viremia, and never requiring antiretroviral therapy. These patients are at risk for advanced, complicated, and widely metastatic disease with extensive bone marrow invasion, which precedes the appearance of local signs and symptoms that commonly lead to death.

Recently, Vianna and colleagues [75] examined a cohort of 534 men aged 49 years and older who had risk factors for HIV. Their goal was to determine the rate of and factors associated with elevated prostate-specific antigen levels. Serum prostate-specific antigen level and HIV serology and T-cell subsets for individuals who were HIV seropositive were measured. Three hundred ten patients were found to be HIV positive. Their statistical analysis found that prostate-specific antigen levels increased with age but did not differ by HIV status. The study recommended that standard prostate-specific antigen evaluations can be made with HIV-positive patients without the need for adjustments. Screening should take place at age 50 unless there is a family history or the patient is African American. A patient's prostate-specific antigen, Gleason score, HIV status, and comorbidities should be evaluated to plan treatment. Patients who are asymptomatic should be offered all possible treatment options, including surgery, radiation, androgen deprivation, and observation. Some clinicians believe that laparoscopic or robot-assisted surgery should be performed when possible to minimize risk of surgeon exposure [76].

Health care worker issues: prophylaxis and prevention of exposure and transmission

With appropriate precautions, health care–related seroconversion should not be a major concern for urologists. Documented occupational-acquired HIV infections are low; 57 occupational HIV infections were documented by the CDC [77]. Percutaneous injuries with hollow needles or cut injuries and mucous membrane exposure with infected blood carries the greatest of risk of transmission. The risk for HIV transmission after a percutaneous exposure to HIV-infected blood has been estimated to be approximately 0.3% (95% confidence interval [CI] = 0.2%–0.5%); after a mucous membrane exposure, the rate is approximately 0.09% (95% CI = 0.006%–0.5%) [78]. Urine carries low HIV titers, and there are no documented cases of seroconversion caused by this type of exposure.

To maintain low rates of HIV occupational transmission, the CDC has published preventive strategies to minimize occupational risks. The emphasis that all blood and body fluids are potentially infectious is at the heart of "Universal Precautions." Precautionary methods include barriers (ie, gloves, gowns), hand washing of contaminated areas after contact, and careful handling and disposing of sharps after their use. Despite the low transmission risk from urine, the use of a camera system during endoscopic procedures should be practiced.

The CDC has set up recommendations for HIV postexposure prophylaxis. Basic exposure that warrants postexposure prophylaxis (ie, exposure to mucous membranes or skin or a superficial percutaneous injury from a source who did not have end-stage AIDS or acute HIV illness) requires treatment with a 4-week, two-drug regimen (ie, zidovudine plus lamivudine). For exposures with increased risk of transmission (ie, high viral load from a source with a deep penetrating exposure), a three-drug regimen may be recommended. There are several combinations for three-drug regimens, and they should include two reverse transcriptase inhibitors (eg, zidovudine plus lamivudine) and a protease inhibitor (eg, lopinavir and ritonavir) [78].

These occupational exposures should be considered urgent medical concerns, and early intervention is essential. Although no randomized, controlled trials have compared one-, two-, and three-drug regimens, the CDC believes that prophylaxis is effective in preventing seroconversion

in persons who received treatment within the initial 24 hours of exposure. Common side effects include nausea, fatigue, headache, and diarrhea. More toxic side effects include neutropenia, lactic acidosis, pancreatitis, and liver failure [78]. A meta-analysis of two- versus three-drug regimens indicated that the latter had a statistically significant worse side effect profile and a slight decrease in compliance [79]. All cases are not equal, and each hospital's employee health department should be consulted on treatment necessity and options.

Summary

In the era of HAART and diligent follow-up, patients diagnosed with HIV have a life expectancy of more than 20 years [80]. We are becoming more involved in the care of patients who have HIV and are severely immunocompromised. Knowledge of the various HIV manifestations of genitourinary conditions and treatment options benefits clinicians and improves patient outcomes.

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